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Feasibility of laser-induced incandescence for on-road measurements of particulate matter emissions

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Feasibility of Laser-Induced Incandescence for On-Road Measurements of Particulate Matter Emissions



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*13th CRC On-Road Vehicle Emissions Workshop
San Diego, California, April 7-9, 2003*

Particulate Matter Collaboratory



NRC/Artium visit to Sandia, April 2001
(~ 4'x4'x4')

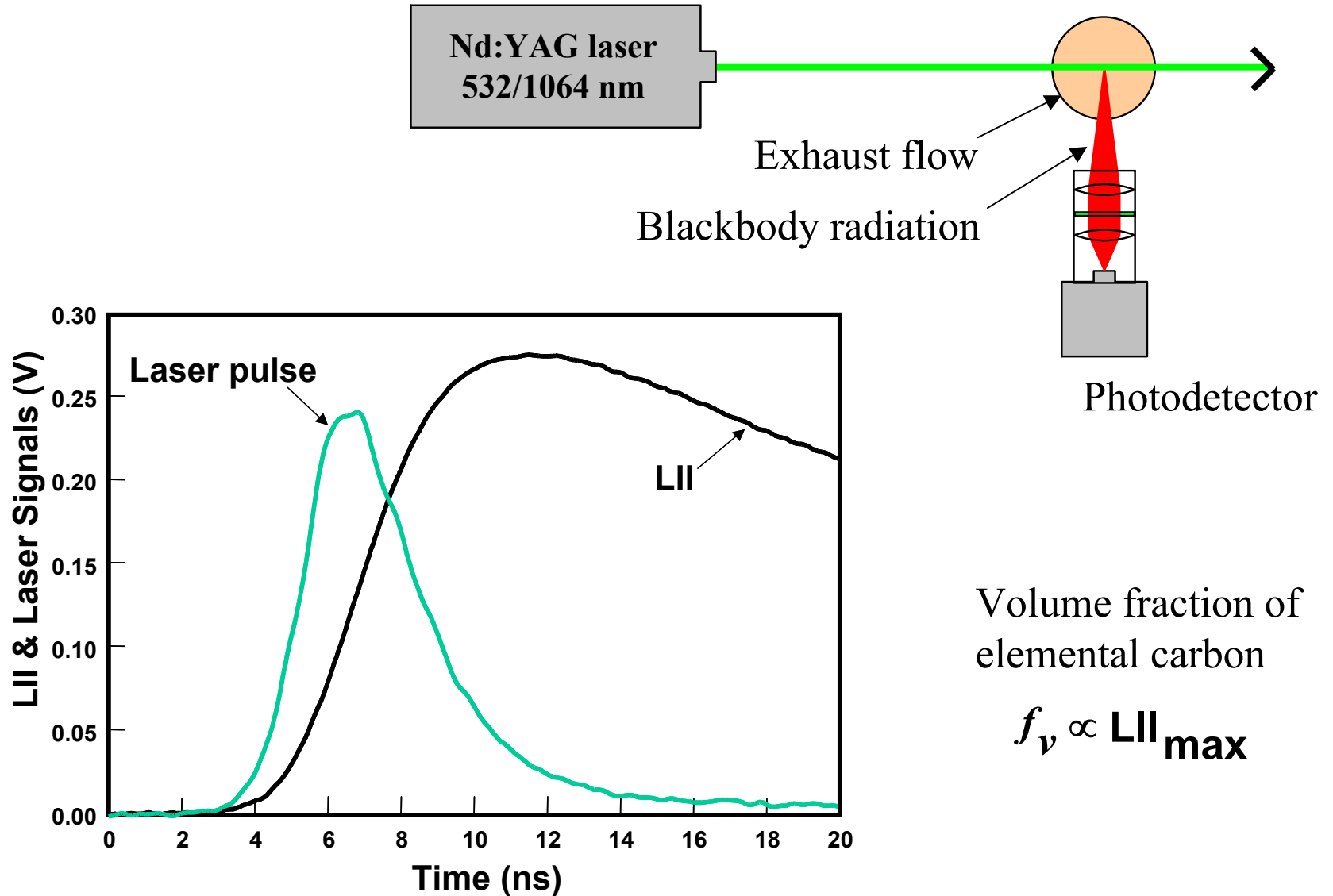
www.ca.sandia.gov/pmc

NRC holds a patent for an *in situ* LII calibration procedure that has been licensed to Artium.

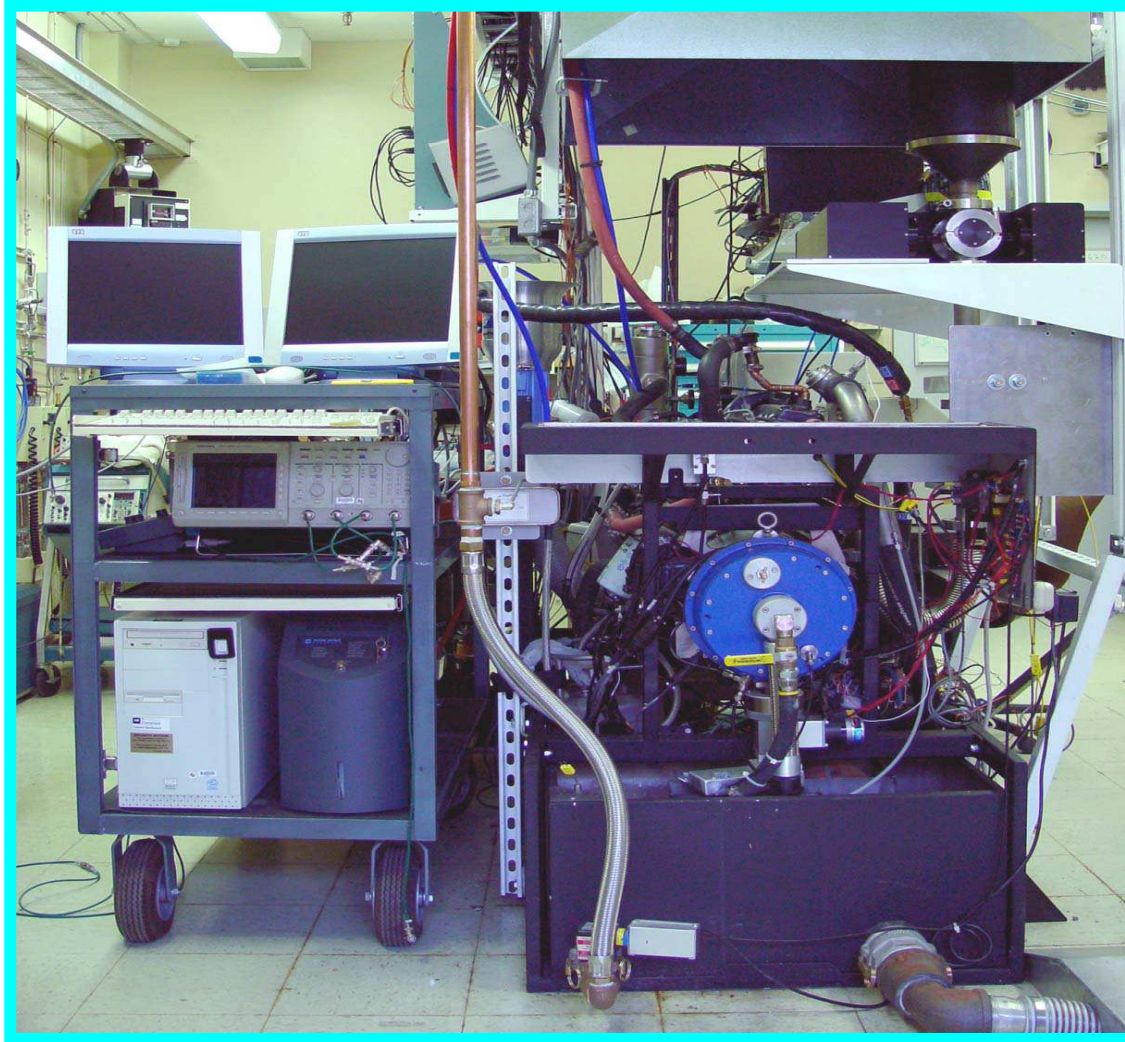
Artium has established offsite access to run their instrument at Sandia (by modem) and NRC (by internet).

Sandia and NRC have a joint task with the International Energy Agency for development of laser-based diagnostics for PM emissions from internal combustion engines.

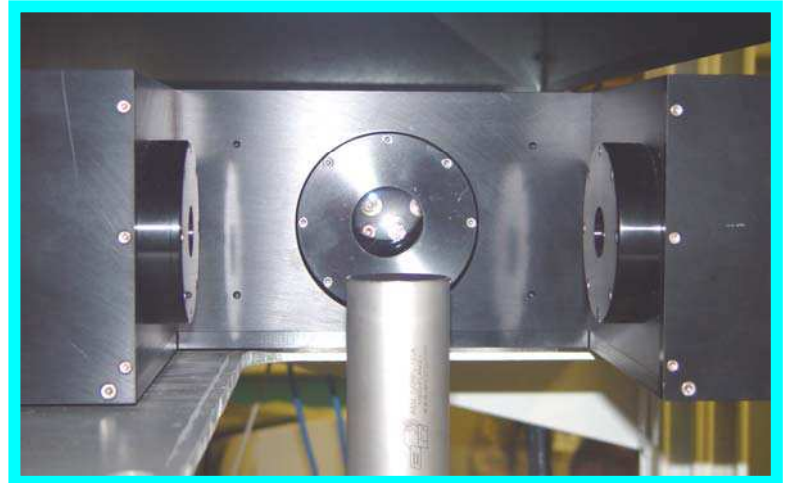
What is LII?



Sandia 1.9L TDI diesel engine lab

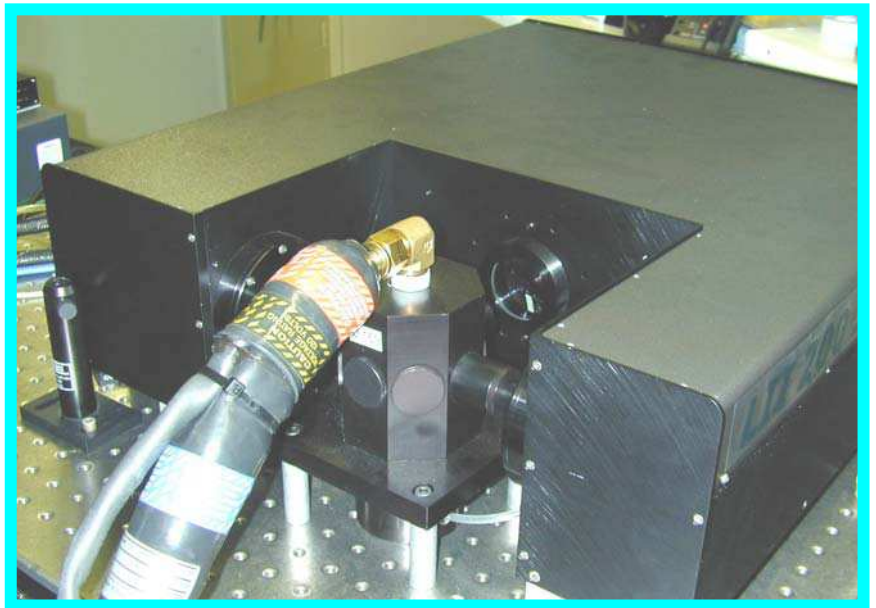


In situ use of Artium LII instrument

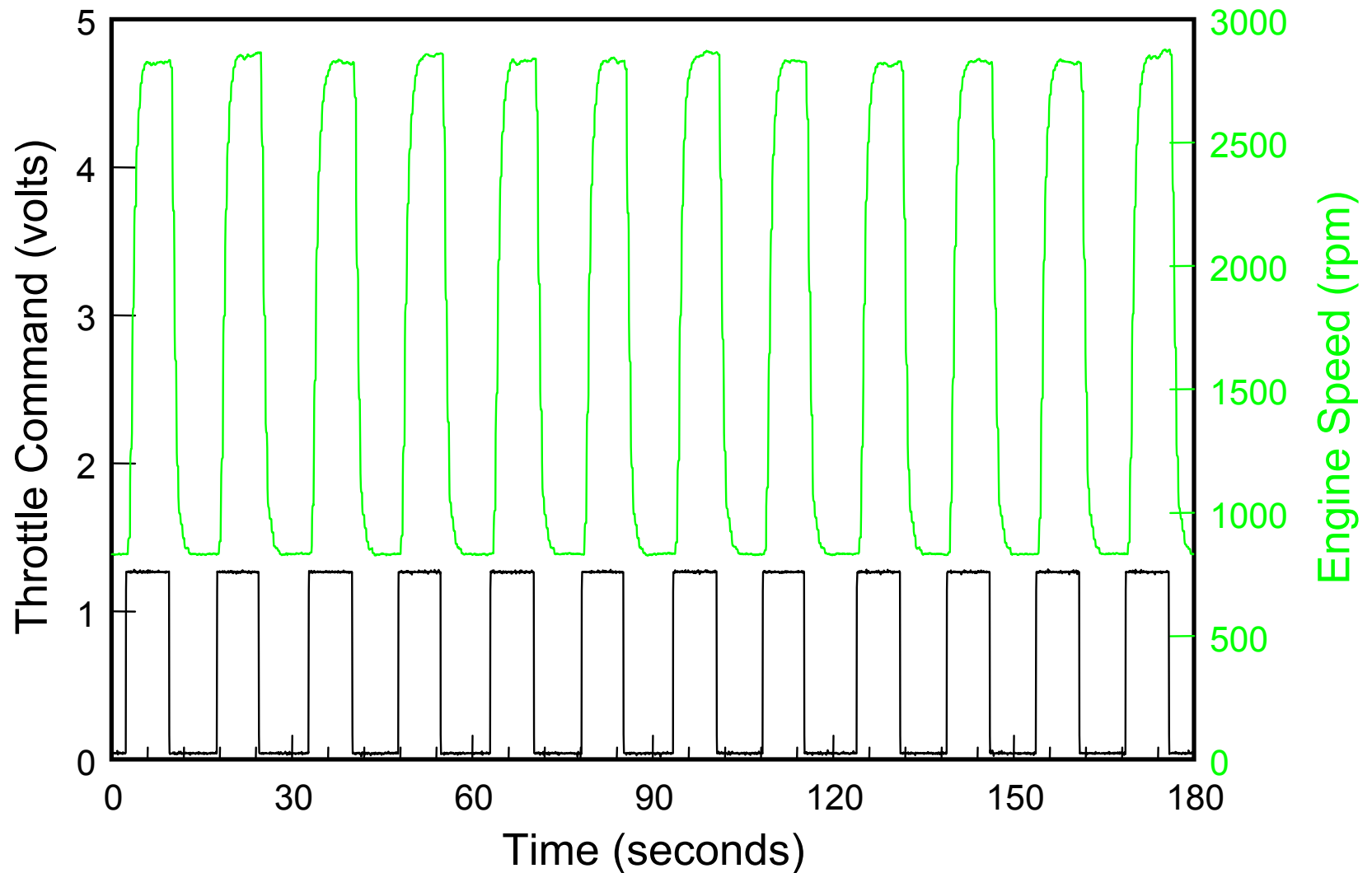


LII 200™ consists of a 50x60x15 cm box that contains the laser, optics, detectors and electronics. All operational functions are controlled by a PC, providing true “turn key” performance.

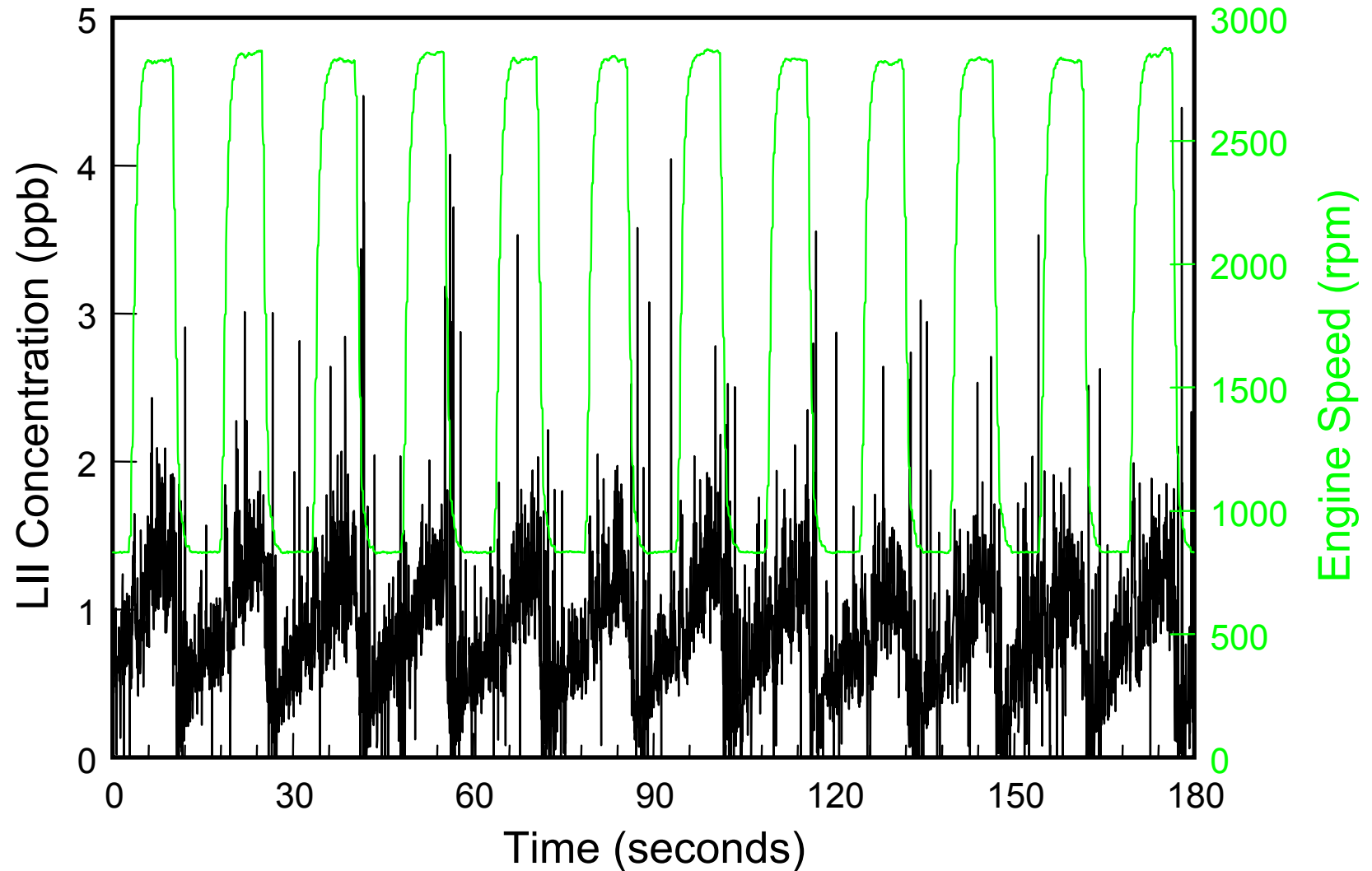
Extractive sampling for road-side testing



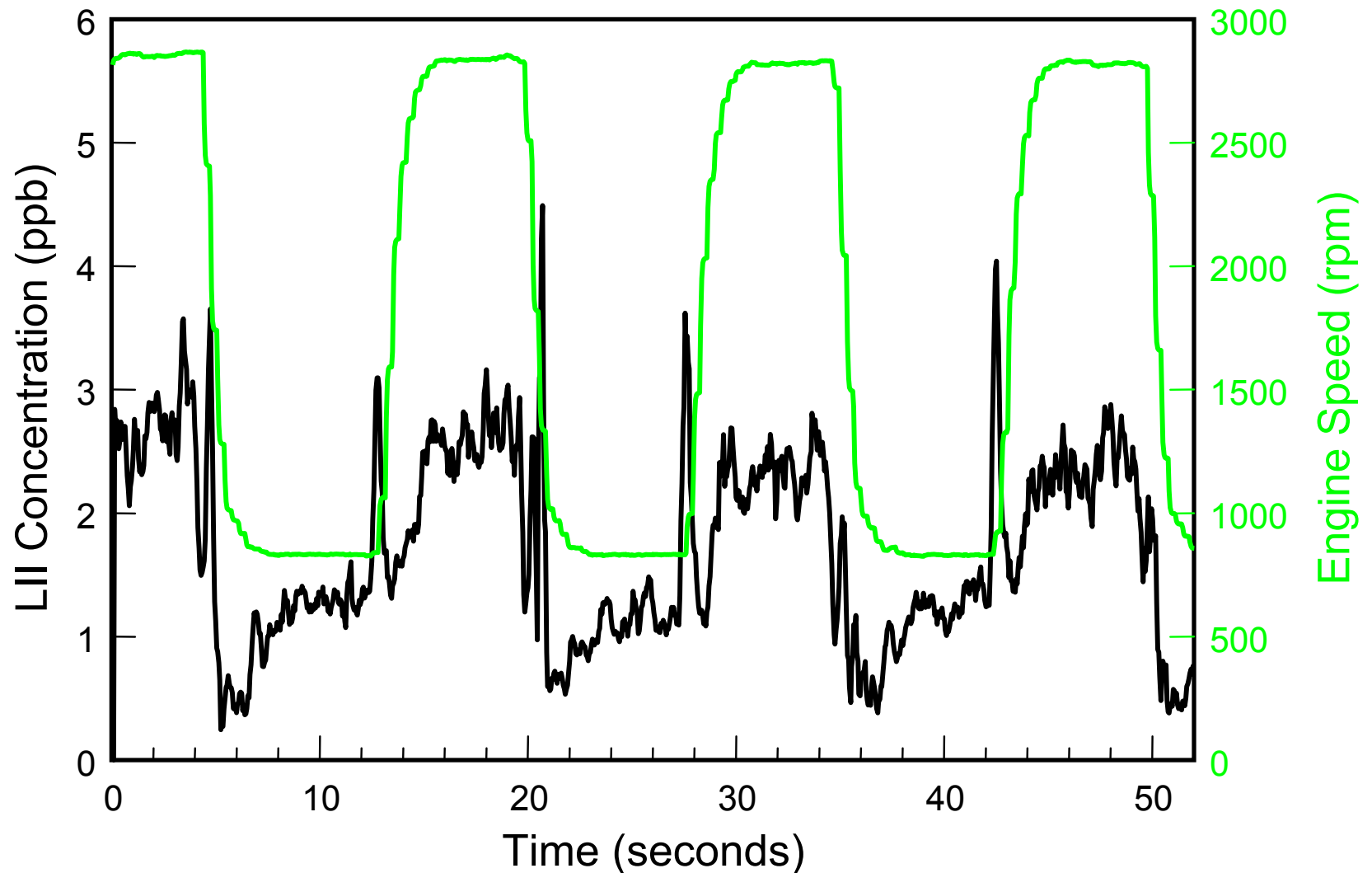
Free acceleration sequence



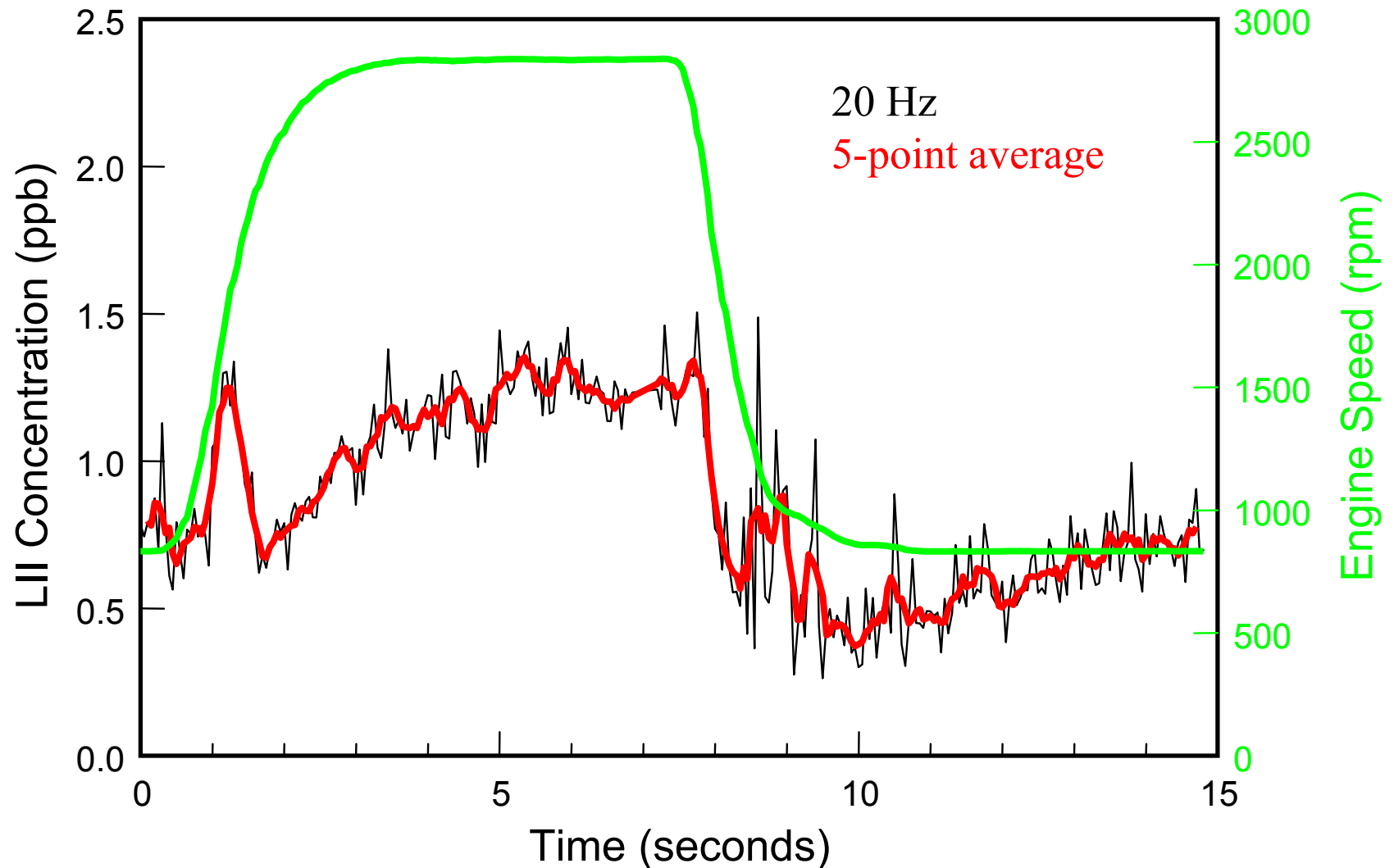
Raw LII data at 20 Hz



Cyclic variations with 5-point smoothing



Effect of ensemble average & data smoothing

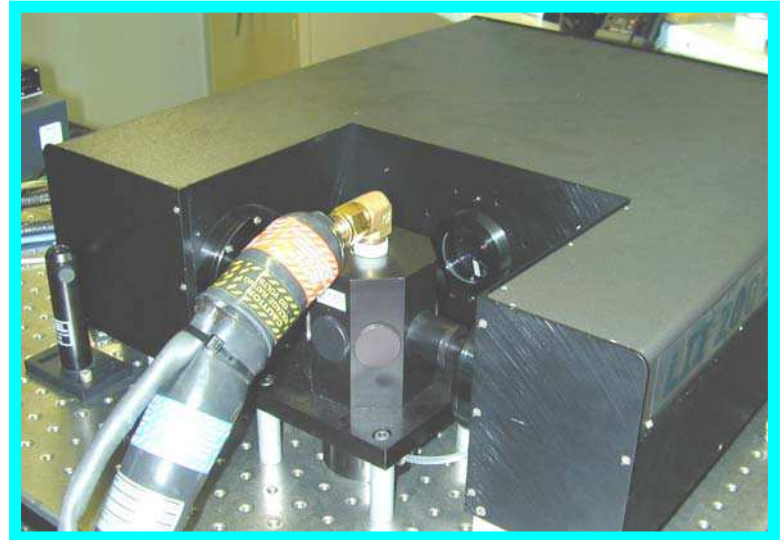


Will LII fit on-board?

Sandia “LII-on-a-cart”
2’x4’x5’ 120V/15A
Exhaust tap/vent



Artium “LII-in-a-box-to-be”
Estimate 2’x3’x3’



Gasoline generator
120V/18A
20”x15”x13”

Extractive sampling locations



Tailpipe



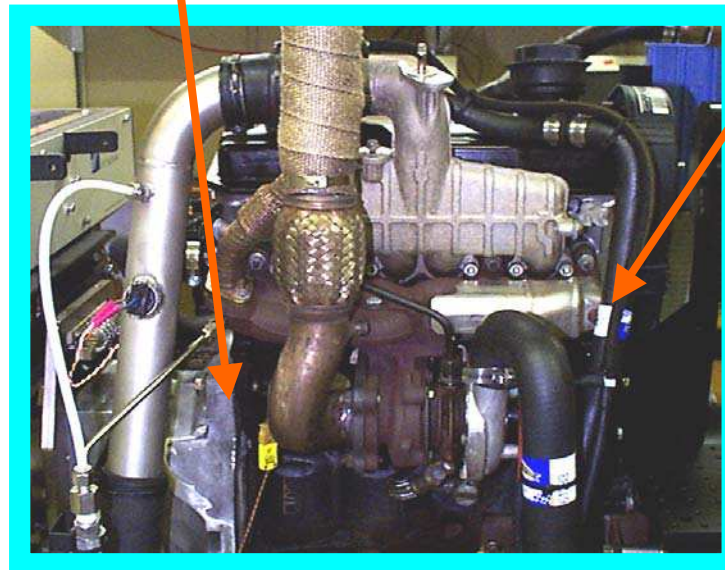
After the turbo



#1 cylinder
exhaust port



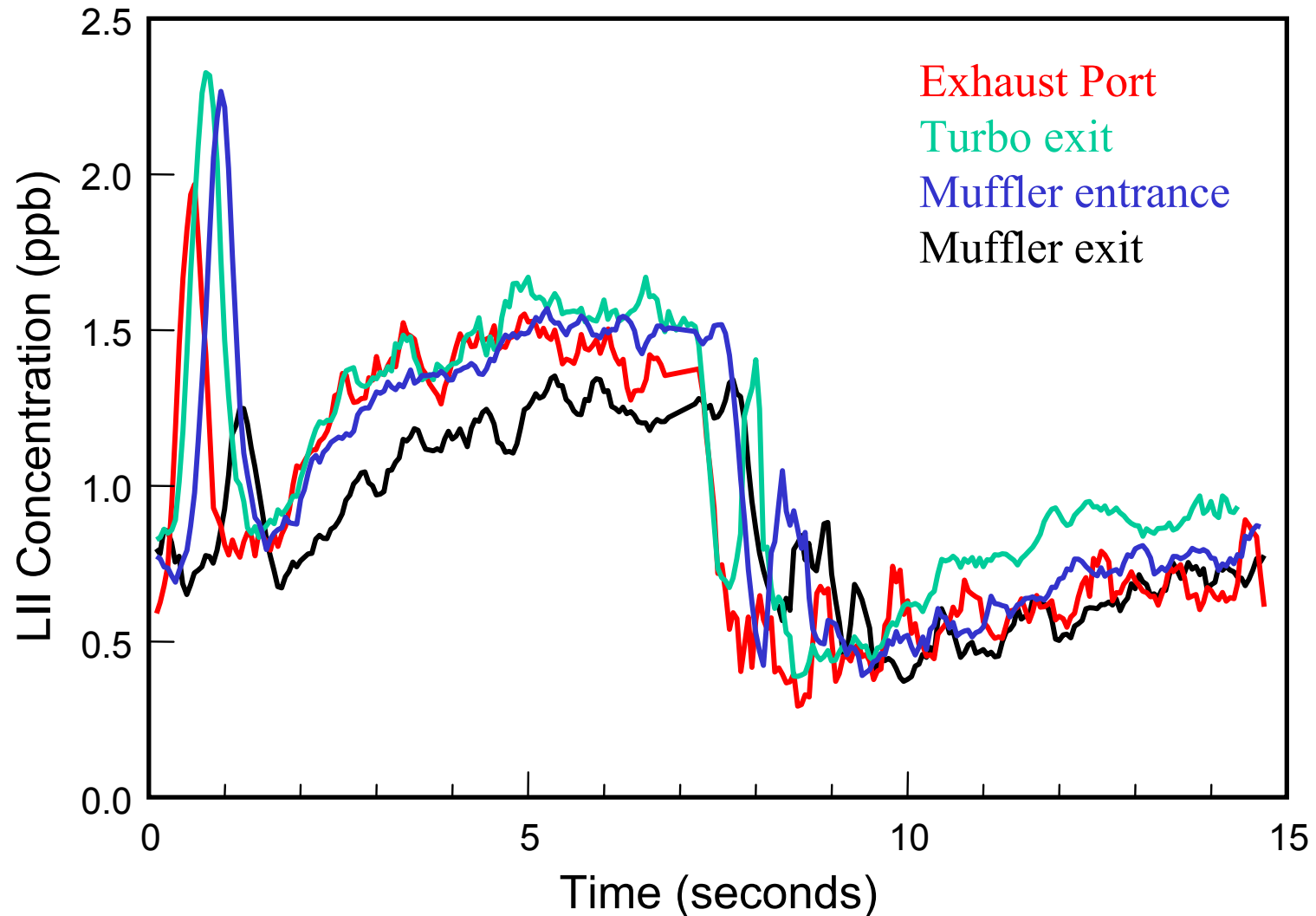
Entrance to DPF



1.9L TDI diesel engine

Effect of extraction location*

*Note muffler, not DPF



Conclusions about on-road LII

Is it feasible? Yes

Is it practical? Not yet

Why not? \$\$\$\$\$\$\$\$\$\$\$\$